Regional Extension Program

Environment and Climate REGIONAL GUIDEBOOK Central South Interior

Central and South Cariboo, Thompson-Nicola, and North Okanagan

Prepared for the
B.C. Ministry of Agriculture and Food
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Central South Interior

Contents

Photo: Emrys Miller

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Contributors

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Sustainable Canadian Agricultural Partnership

cleanBC

British Columbia

Canada

Introduction to the guide

Agricultural producers are grappling with the impacts of climate change and are on the front lines of developing strategies that maintain economic viability alongside environmental sustainability. Top issues, response strategies, and feasibility of practices differ across British Columbia's diverse ecoregions, highlighting the need for targeted extension and applied research projects. To meet these needs, the B.C. Ministry of Agriculture and Food's new Regional Extension Program aims to increase on-farm adoption of management practices that support producers in making their operations more climate resilient, sustainable, and economically viable.

This regional guide aims to serve as a resource for producers, on-the ground researchers, and consultants to reflect on the climate issues challenging environmental sustainability and local farm businesses and food production.

In this guide, three overarching strategies address the agricultural climate and environment priorities identified by producers across the province:

Adaptation: Prepare for and respond to a changing climate. Practices in this guide are largely adaptation focused, reflecting the immediate impacts producers are experiencing.

Mitigation: Reduce greenhouse gas emissions and increase carbon sequestration.

Environment: Protect and regenerate soil, water, and air quality. Improve biodiversity and protect sensitive habitats.

The priority issues highlighted in this guide were identified by a regional extension committee that represents the climates, soils, and commodity groups in each region, facilitated by the B.C Ministry of Agriculture and Food. For more information, contact your Regional Agrologist or AgriServiceBC. The content of this document may change with the results of engagement with producers in the region.

Each priority issue described in this guide includes:

- **An overview of the priority** and why it is important to producers in the region.
- An **inventory** of past and current applied research and extension projects relevant to the issue. Many of these projects were implemented under the BC Ministry of Agriculture & Food's Climate Change Adaptation Program (2008-2023) with support from government, industry, and research partners.
- **Beneficial management practices and work that can be built on** to address priority areas.
- Current **funding programs** associated with each priority area.
- Current **provincial tools** relevant to each priority area.

Introduction to the region

Regional Boundaries

For the purpose of the Regional Extension Program, the Central South Interior agricultural region includes the North Okanagan, Thompson-Nicola, Central and South Cariboo-Chilcotin, and Squamish-Lillooet Regional District Electoral Area A and B. This region includes portions of the Thompson-Okanagan agricultural census district and the Cariboo census district. The statistics included throughout this document reference the regions that are used to collect the associated data and may not reflect the regional boundaries for this program.

Agricultural Sector Demographics

Beef Cattle

Photo: Shutterstock

Dairy

Photo: Ministry of Agriculture and Food

Small Ruminants

Photo: Nicole Pressey

Tree Fruits

Photo: Emrys Miller

Forage

Photo: Emrys Miller

Poultry

Photo: Emrys Miller

Field Vegetables

Photo: Emrys Miller

Wine Grapes

Photo: Emrys Miller

TRENDS IN FARM NUMBERS, FARM TYPE, AND FARMLAND AREA

(Census of Agriculture, 2021)

- In the Cariboo, farm numbers dropped 20% and farmland area decreased by 24% between 2011 and 2021. Hay production has decreased the most – the number of farms producing hay has dropped by 32% since 2011.
- In the Cariboo, beef cattle have replaced hay as the predominant commodity in the last decade (18% of provincial total).
- In the Thompson-Okanagan, farm numbers have decreased by 20% in the last 10 years but farmland area has stayed the same, decreasing the least in the province.
- The Thompson-Okanagan contains a significant portion of the province's tree fruit (18%), hay (26%), vegetables and melons (23%), and beef cattle (27%) operations.
- In both regions the largest loss of farm numbers was for those with annual revenues under $99,000. There was slight growth in farms with revenues over $100,000.
- 15% of producers in the Cariboo and 9% in the Thompson-Okanagan are implementing renewable energy production in their operation.

Regional Climate Change Impacts

The Central South Interior region is already experiencing the impacts of climate change. Increases in the average number of days over 30°C, more frequent and intense wildfires, drier summer conditions, and more frequent extreme rainfall events have become the norm over the past several years. Agricultural production in the Central South Interior occurs in three main and climatically distinct areas: the North Okanagan, Thompson-Nicola, and Cariboo. The impacts of climate change differ across these regions and their sub-climates, and may not always be consistent with generalized regional climate projections. Overall trends of reduced summer precipitation, increased shoulder season precipitation, and warming temperatures are impacting all areas.

The changes being observed in this region are consistent with the 2015 Pacific Climate Impacts Consortium (PCIC) 2050 projections. More recent climate models updated continue to show the same trends.

PCIC Climate Projections: Okanagan & Cariboo, 2050

TEMPERATURE

2.1°C to 4.4°C increase
in annual average temperatures

Average of
47 more
frost free days annually
(North Okanagan)

35 to 64 more
frost free days annually
(Cariboo)

PRECIPITATION

11% increase
in average spring precipitation
(Okanagan)

Drier summer conditions
overall

25 to 27% decrease
in precipitation falling as snow
in the Cariboo and Okanagan
respectively

EXTREMES

Increase in frequency and magnitude
of extreme rainfall events

Increase
in average number of
days over 30°C
annually

Projections provided by the Pacific Climate Impacts Consortium in 2015. 2050 averages are compared to the baseline historical period of 1961-1990.

Photo: Nicole Pressey

1 Water sustainability and storage

Photo: Lesley Edwards

Adaptation

Changing climatic, regulatory, and farm management conditions are impacting water sustainability and storage capacity needs in the Central South Interior. Water needs for crops and livestock are increasing as the region experiences lower than normal precipitation in the summer months. Sustainable water management is a priority for producers to maintain productivity and allow water sources to recharge for future use. Drought conditions have reached levels 3-5 (mid to maximum in provincial drought severity ranking) across the region in three of the last five years during summer and/or fall periods. By September 2023, many of the areas in this region reached a drought level 5, and curtailment orders were issued to reduce water use.

The 2021 Agricultural Census indicated that 66% of farms in the Thompson-Okanagan are irrigated, compared to 18% in the Cariboo. Both regions are projecting significantly increased water demand on diminishing surface water sources. Projected growth in the tree fruit sector in the Thompson-Nicola is expected to further draw from existing water supply. Concerns around agricultural water have emerged with the processing delays and communication challenges that have occurred with the rollout of the new groundwater licensing requirement in the 2016 Water Sustainability Act. Interest in support for increased water storage is high, as drought conditions have resulted in curtailment orders on licensed water users.

1.1 Why is water sustainability and storage a priority?

- **DROUGHT leading to insufficient forage and winter feed for livestock:** Reduced precipitation throughout the summer has led to significant yield declines, forcing some ranchers to buy feed they would normally grow themselves at demand-surge costs. Livestock producers across the province have been challenged with difficult decisions (e.g., reduction of herd size, feeding winter stock early, having pasture not available late in the grazing season) and relying on additional supports and programs.
- **WATER SUPPLY decreased by changing temperature and precipitation patterns:** The provincial trend shows decreased snowpack, warmer spring temperatures, and decreased precipitation all impact surface water supply. Surface water makes up two-thirds of the Okanagan Basin's total water supply and provides water for 75% of the irrigated agricultural land in the region.
- **MORE INTENSE RAINFALL causing flooding, runoff, and erosion:** This results in high economic and ecological costs for producers. Agricultural properties in the Thompson-Okanagan and Cariboo regions have been impacted by flooding in recent years.

1.2 What water sustainability and storage work has been done?

** Links in green are producer-oriented resources and tools*

Project	Project Resources*	Location	Year
DROUGHT			
Identifying water-efficient practices that co-deliver maximum benefits for tree fruit production & climate change mitigation	*In progress, Agriculture and Agri-Food Canada*	Okanagan	2021-2025
Post-harvest deficit irrigation in cherries	Project report Research Summary Fact sheet	Okanagan	2019-2023
Farm water fix: climate resilient irrigation systems and management	Video series	Kootenay/Boundary, Provincial	2022
Climate resilient livestock surface water in the Cariboo	Assessment methodology (2017) Site assessment case studies, Report on pilot projects (2020) Virtual training series (2022) Fact sheets Range unit maps	Cariboo	2017-2022
Drought stage trigger guidelines for Okanagan mainstem lakes and rivers	Project report	Okanagan	2021
Irrigate better: anatomy, pipe design, emission design, scheduling and monitoring	Webinar series	Kootenay/Boundary Provincial	2018
Optimization of water use and cost in vineyards in the Okanagan using precision irrigation	Project report Factsheet series: irrigation Tool: irrigation efficiency calculator	Okanagan	2018
WATER SUPPLY			
Resiliency: forage, water and climate change risk assessment pilots	*In progress, Ministry of Agriculture and Food*	Cariboo, Hwy 16, Kootenay-Boundary	2023
Okanagan water supply alerts for agricultural users	Project report: Assessment of Okanagan Water Suppliers Report (2018) Research summary and evaluation (2019) Okanagan Water Board resources for agricultural users	Okanagan	2018-2019
Assessment of Okanagan water suppliers and communications planning	Water supply assessment report Water supply status communications report	Okanagan	2017-2019
Enhancing agricultural dams in the Cariboo	Project Summary Full Project Report Workshop summary	Okanagan	2017

Project	Project Resources*	Location	Year
Climate change risk assessment tool for livestock water ponds	Project report	Cariboo	2017
Summary of water management resources for agriculture in BC	Project report	Bulkley-Nechako / Fraser Fort George	2021
MORE INTENSE RAINFALL			
Farm flood readiness toolkit	Toolkit Factsheet: Okanagan Factsheet: landscape level mitigation	Okanagan, Fraser Valley	2022
Livestock sector emergency preparedness for flooding	Factsheet	Provincial	2019
Horticulture sector emergency preparedness for flooding	Factsheet	Provincial	2019
Agricultural waterways: drainage maintenance and stewardship	Guide	Provincial	2018
Supporting riparian health on farmland for flood protection	Project report	Kootenay-Boundary	2023

1.3 What's Next: Looking Ahead

Sustainable agricultural water management is shaped by regulatory requirements, regional conditions, and farm level practices. Field-level water conservation is a primary adaptation strategy for producers as they respond to reduced water supply associated with climate impacts.

On-Farm Management Practices

Field-level water conservation is concerned with balancing increased water demands for crops and livestock with reduced water supply. Increasing water use efficiency is primarily achieved through targeted irrigation or watering systems that reduce overapplication, evaporation, and greenhouse gas emissions. As the Central South Interior region has a diverse mix of dryland and irrigated agriculture, all sectors face challenges to implement efficient practices. On-farm mangement practices to increase water conservation include:

- Water-efficient irrigation systems
- Irrigation scheduling
- Water quality protection measures
- Soil moisture meters and other technologies
- Rainwater collection and storage

Funding Programs: WATER STORAGE AND SUSTAINABILITY

The BC Ministry of Agriculture and Food, with delivery support from the Investment Agriculture Foundation (IAF), offers the following cost share funding programs that address water sustainability:

- Environmental Farm Plan Program (EFP)
- Beneficial Management Practices Program - *water infrastructure projects*
- Agricultural Water Infrastructure Program
- Extreme Weather Preparedness for Agriculture - *flooding preparedness and extreme heat preparedness streams*
- AgriStability - *agriculture income protection*

Provincial Toolbox: WATER SUSTAINABILITY

BC Agriculture Water Calculator

BC Irrigation Water Use Calculator

Agricultural Irrigation Scheduling Tool

BC Drought Information Portal

Drought in Agriculture Website

BC floodplain maps by region

Building on Recent Projects

Drought response:

- Support commodity-specific pilot projects that develop and implement drought management action plans
- Support applied research on water management and efficient irrigation systems
- Identify commodity-specific water management knowledge transfer priorities
- Support field-based water management demonstrations

Excess precipitation:

- Demonstration and assessment of run-off and erosion control
- Demonstration and assessment of low-cost flood mitigation infrastructure and practices

Water access and storage:

- Re-evaluate needs for agricultural dam maintenance and upgrades
- Pilot collaborative improvements of agricultural dams
- Apply and trial new tools for livestock surface water risk assessment process
- Support demonstration of resilient water developments in high-risk range units

Photo: B.C.Photo

2 Soil health management

Photo: Shutterstock

Adaptation

Mitigation

As climate variability and extreme events increase, management practices for soil health are critical for agricultural resilience. Healthy soils suited to crop production have good porosity for air circulation and water infiltration and retention as well as adequate organic matter to support soil biological and chemical processes that convert nutrients into plant available forms. Maintaining soil cover and reducing disturbance helps maintain a favourable environment and conserves soil health. Beneficial management practices that support these soil processes can improve crop productivity and quality as well as enhance overall farm resilience.

2.1 Why is soil health management a priority?

- **SOIL DEGRADATION reduces soil capabilities that support adaptation to climate impacts:** In particular, degraded soil structure from a) compaction from equipment or livestock or b) intensive tillage practices reduce the soil's air porosity and organic matter content that are needed for good water infiltration, water retention, and root health.
- **NUTRIENT CYCLING processes that support natural soil fertility can be optimized in well-managed soils:** The soil organisms that cycle nutrients and make them available for plants rely on organic matter and suitable soil pH. Supportive practices include organic amendments, cover cropping, maintaining soil cover, and reducing soil degradation (above). In the Central South Interior region, the success of cover cropping is regionally dependent; for example, shorter growing seasons and limited irrigation infrastructure in the South Cariboo may increase challenges of cover crop adoption and establishment.
- **CARBON SEQUESTRATION potential is high in agricultural operations using beneficial soil management practices:** Soils that have vegetation cover or carbon inputs like compost or manure foster healthy root systems and avoid compaction, which leads to carbon sequestration in the soil. Carbon sequestration mitigates climate change by reducing carbon dioxide in the atmosphere. Practices such as intensive tillage or those that result in bare soil can reduce the ability of soils to sequester carbon from the atmosphere.

2.2 What soil health management work has been done?

** Links in green are producer-oriented resources and tools*

Project	Project Resources*	Location	Year
SOIL DEGRADATION			
Exploring pasture renovation techniques	*In progress, Ministry of Agriculture and Food*	Cariboo, Central South Interior	2023
Demonstrating no-till pasture rejuvenation practices in central and northern interior of BC	Research summary Full Project report	Cariboo-Chilcotin, Fraser-Fort George	2023
Multi-functional pasture rejuvenation in the Cariboo	Research summary Full Project report	Cariboo	2023
Soil quality test kit [Pastures]	Soil quality test kit	Cariboo, Bulkley-Nechako	2018
BC Climate Agri-Solutions rotational grazing projects	Extension resources	Lillooet, Vancouver Island	2023
Improving soil health through enhanced water infiltration	Tool: Grab and go template for on farm research	Kootenay/Boundary	2018
NUTRIENT CYCLING			
BC Living Lab: Tree fruit and wine grapes BMPs – producer-led testing, refinement, monitoring and adoption of interrow cover crops to improve soil health	*In progress*	Okanagan	2023-2027
Provincial Cover Crop Factsheets (23 cover crop species)	*In progress, Ministry of Agriculture and Food* *Forthcoming tool: digital cover crop selection tool*	Provincial	2023
BC Climate Agri-Solutions cover cropping projects	Water supply assessment report Water supply status communications report	Provincial	2023
BC Living Lab: Cattle & Forage BMPs – producer-led testing, refinement, monitoring and adoption of extended grazing strategies to improve feed availability, soil health, and GHG emissions	Extension resources	Thompson-Nicola and Cariboo	2023-2027
Strategies to integrate cover crops into vineyards to enhance sustainability and productivity	*In progress*	Cariboo	2017
Strategies to integrate cover crops into vineyards to enhance sustainability and productivity	*In progress, Agriculture and Agri-Food Canada*	Okanagan	2018-2023
CARBON SEQUESTRATION			
Growing fruit and capturing carbon in the Okanagan	Vineyard management for soil carbon capture Life cycle assessment of mulch on orchards Workshop: 3-part virtual series	Okanagan	2018-2022
Impact of management intensive grazing on soil health	Research summary Full project report	Cariboo, Thompson	2018

2.3 What's next: Looking ahead

Producers are increasingly employing beneficial management practices that aim to improve soil health outcomes to support productivity and resilience. These practices can contribute to climate adaptation, reduction of net greenhouse gas emissions, and environmental management. In the Central South Interior, soil health management practices generally fall into two strategies:

On-Farm Management Practices

Intensive grazing strategies are designed to manage livestock in ways that support soil health. Ranchers in the Cariboo are leaders in practices that reduce animal impact on soils by managing impact over time and space. Letting pastures rest long enough for grass and forages to regenerate builds robust forage root systems that maximize water retention and carbon sequestration. Intensive grazing practices include:

- Rotational grazing
- Bale grazing
- In-field winter feeding

Conservation and management of soil organic matter is critical to climate adaptation and mitigation. Practices such as retention of vegetation and reduced tillage can conserve soil structure and organic matter, but success of implementation is regionally dependent. Practices include:

- Cover cropping (and plowing in cover crops)
- Inter-seeding
- No-till seeding
- Reduced tillage
- Integration of woody perennials (i.e. shelterbelts)
- Conservation tillage (i.e. tillage retaining crop residues)
- Nutrient management

Building on Recent Projects

Recommendations from the Minister's Advisory Group on Regenerative Agriculture and Agritech:

- Identify and share best soil management practices using a producer-centric approach for implementation and knowledge sharing
- Identify practical indicators of properties that support soil relevant functions, measure, and communicate baselines values at farm, regional, and provincial levels; determine realistic improvement goals; measure the impacts of practices

B.C. Living Laboratories Projects:

- Building on dairy, cattle and forage, vegetable, and perennial row crop cover cropping on-farm trial sites to increase demonstration sites and extension opportunities

Funding Programs: SOIL HEALTH MANAGEMENT

- Environmental Farm Plan Program
- Beneficial Management Practices Program
- BC Climate Agri-Solutions – *cover cropping and rotational grazing streams* (Agriculture and Agri-Food Canada 2022/2023)*
- On-Farm Climate Action Fund – *rotational grazing* (BC Forage Council 2022/2023)*

*The On-Farm Climate Action Fund was delivered through both BC Climate Agri-Solutions and BC Forage Council in 2022-2023.

Provincial Toolbox: SOIL HEALTH MANAGEMENT

BC Nutrient Management Calculator

Manure Nutrient Calculator

BC Soil Information Finder Tool

3 Nutrient management practices

Photo: Shutterstock

Mitigation

Environment

Nutrient management is an essential step in maintaining soil health and optimizing crop yield and quality. Nutrient management involves applying the **right type of nutrient sources**, such as manure, fertilizer, or compost in the **right amount**, in the **right place** and at the **right time** for the specific crops being grown (the 4Rs). Soil analysis and understanding crop nutrient requirements are important for informing nutrient application decisions.

A major reason for soil testing is to evaluate soil fertility, which is the ability of the soil to supply crops with nutrients. Effective nutrient application maximizes crop productivity and saves producers unnecessary costs of overapplication. Nutrient management is also crucial for environmental health, as undermanaged nutrient containment, storage, or incorrect application risks polluting surrounding water resources or producing greenhouse gas emissions. BC has regulations surrounding nutrient management that are outlined in the Code of Practice for Agricultural Environmental Management.

3.1 Why is nutrient management a priority?

- **OPTIMAL CROP PRODUCTIVITY can be achieved through effective nutrient management:** Crop yields and crop quality depend on optimal nutrient availability and uptake. Producers need soil test results and knowledge of crop nutrient requirements to make informed management decisions. Crops have different fertility needs and require commodity specific nutrient management to optimize productivity.
- **COST EFFICIENCY is achieved when producers don't bear costs of nutrient overapplication:** Input costs can be reduced as nutrient use efficiency is optimized.
- **NUTRIENT LOSS poses an environmental risk to water resources:** Excess nitrogen and phosphorus that are not used by crops can get into surrounding waterways or aquifers. Nutrients and pathogens from manure can pose health risks to humans and animals when they are consumed in drinking water. Nutrients (most commonly phosphorus) can cause algae blooms that damage aquatic ecosystems.
- **NITROGEN EMISSIONS pose climate and health risks:** Ammonia emissions can reduce air quality and negatively impact human health, and nitrous oxide is a potent greenhouse gas that contributes to climate change.

3.2 What nutrient management work has been done?

** Links in green are producer-oriented resources and tools*

Project	Project Resources*	Location	Year
OPTIMAL CROP PRODUCTIVITY			
Nitrogen management in viticulture and enology	*In progress, Agriculture and Agri-Food Canada*	Okanagan	2018-2023
Central interior forage fertilization trial	*In progress, Ministry of Agriculture and Food*	Central Interior	2021-2023
Demonstration of innovative corn production technologies	Research summary Full project report Factsheet: interseeding Factsheet: strip tillage Factsheet: variable rate	North Okanagan	2023
Organic vegetable nutrient management project	Field trial results summary Workshop: Nutrient management on organic farms Podcast: N and P balance Podcast: nutrient pollution	Fraser Valley, Vancouver Island	2021
NUTRIENT LOSS			
Phosphorus recommendations in silage corn systems; agri-environmental indicator for risk of P transfer to water sources	*In progress, Agriculture and Agri-Food Canada*	Okanagan, Fraser Valley	2018-2023
Phosphorus Index	*In progress, Ministry of Agriculture and Food*	Okanagan, Fraser Valley, Vancouver Island	2023-2024
Soil nitrate survey of agricultural fields in the Hullcar Valley	Project report	Okanagan	2017-2019
BC Climate Agri-Solutions nitrogen management projects	Nitrogen management extension resources	Provincial	2023
Soil sampling guidelines for British Columbia	Soil Sampling Guidelines	Provincial	2023
Phosphorus action plan for the Shuswap watershed	Action plan Research report	Thompson-Nicola	2022
Ministry of Agriculture soil nutrient study	Project report	Okanagan, Central Interior, Vancouver Island	2020
Agriculture Environmental Management Code of Practice for Cattle Operations	Webinar	Provincial	2019
Agricultural nutrient management in the Shuswap watershed	Project report	North Okanagan/ Thompson-Nicola	2014

Funding Programs: NUTRIENT MANAGEMENT

- Environmental Farm Plan Program (EFP)
- Beneficial Management Practices Program - *nutrient and waste management projects*
- BC Climate Agri-Solutions (2022/2023) - *nutrient management stream*

Provincial Toolbox: NUTRIENT MANAGEMENT

Nutrient Management Calculator

Nutrient Management Plan Training

Application Risk Management Tool

Manure Nutrient Calculator

Soil Test Phosphorus Converter

Post-Harvest Nitrate Test Calculator

3.3 What's next: Looking ahead

Nutrient management is a key component of agricultural management for producers, as optimal nutrient efficiency can help ensure crop quality and yield, cost efficiency, and environmental protection. Beneficial management practices for nutrient management can be thought of within three strategies:

On-Farm Management Practices

Nutrient application and sourcing focus on how, when, and which nutrients are applied to support optimal efficiency. Efficient use of nitrogen on farms can result in reduced greenhouse gas emissions, as well as reduced input costs for farmers. Practices include:

- Soil testing and analysis
- 4R nutrient management: right time, right place, right rate, right source
- Precision application (i.e. low trajectory manure spreading/ injecting)
- Variable rate application

Soil and crop management is concerned with improving soil health and managing crops to enhance nutrient cycling. Management practices can overlap with other priority areas, such as soil health management, and include:

- Soil testing and analysis
- Crop rotation
- Cover cropping
- Organic matter conservation
- Reduced tillage

Reducing risks to the environment from nutrient pollution occurs by reducing nutrient losses from the field to surrounding terrestrial and aquatic areas. Environmental protection is largely supported by effective nutrient, soil, and crop management strategies. Management practices include:

- Buffer zones around manure storage areas
- Effluent management
- Nutrient recovery and recycling
- Riparian protection and restoration
- Appropriate rates of application based on factors above

Building on Recent Projects

- Manure solids separation technology study and pilot
- Building on the BC Living Labs dairy manure injection field trials to increase demonstration sites and/or extension opportunities

4 Management for biodiversity & habitat

Photo: Shutterstock

Adaptation

Mitigation

Environment

Natural habitats and biodiversity provide benefits for agriculture production. For example, restoring or improving riparian areas can provide ecosystem services, including lowering flood risk and increasing biodiversity. Critical ecosystem services such as habitat connectivity, native refuge, food webs, and riparian area health have been impacted across the province from a variety of land use practices. Agriculture has a unique position in land stewardship because it is fundamentally connected to wildlife habitat and often integrates habitat features and practices that can support biodiversity.

There can be conflicts between agricultural lands and the wildlife that inhabit them. Achieving a balance that protects wildlife and their habitats and maintains agricultural productivity is essential. Producers may need to implement creative strategies and infrastructure to protect crops or animals from wildlife damage or interference.

4.1 Why is management for biodiversity and habitat a priority?

- **HEALTHY RIPARIAN AREAS provide ecosystem services that may help reduce the risk of flooding:** Healthy riparian areas are more resilient to extreme precipitation events and flooding, which can prevent extreme erosion and costly damage to arable land and infrastructure.
- **POLLINATION ecosystem services are critical for many crops:** Wild pollinators make significant contributions to crop pollination. Habitat loss and lack of food sources for pollinators can negatively impact farm productivity.
- **AGROFORESTRY integrates management strategies such as silvopasture to balance benefits of agriculture production with habitat and other environmental values:** In BC, use of silvopasture practices are typically supplementary to conventional forestry, range and pasture management. Silvopasture can maintain or augment forage resources for both livestock and native ungulates, while also contributing to carbon sequestration and environmental stewardship goals such as enhanced riparian area protection.
- **WILDLIFE CONFLICT creates tension between agricultural production and biodiversity conservation:** Striking a balance between agricultural production and wildlife conservation goals requires multi-faceted strategies and ongoing collaboration. As climate impacts shift wildlife habitats and patterns, impacts on agriculture will shift and require new strategies
- **WILDLIFE CONSERVATION supported by on-farm landscape connectivity features:** Landscape elements, such as vegetation buffers, can provide habitat that boosts biodiversity and improves connectivity between agricultural and wild areas. The 2021 Census of Agriculture indicates that 56% of farms in the Cariboo and 31% of farms in the Okanagan contain vegegative buffers, shelterbelts, or windbreaks.

4.2 What biodiversity and habitat work has been done?

** Links in green are producer-oriented resources and tools*

Project	Project Resources*	Location	Year
HEALTHY RIPARIAN AREAS			
Riparian restoration: debris barriers reduce effects of livestock grazing	Academic article: Debris barriers reduce effects of livestock grazing along streams after timber harvest	Okanagan	2021
Crown land invasive plant management in the Thompson-Nicola	Progress report	Thompson-Nicola	2020
Riparian management field workbook for streams and small rivers	Field workbook	Provincial	2019
Agricultural waterways: drainage maintenance and stewardship	Guide	Provincial	2018
Agricultural benefits of riparian rehabilitation	Project report Factsheets	Okanagan	2018
Grazing impacts on wetland habitat	Academic article: Livestock grazing in intermountain depressional wetlands: effects on breeding waterfowl	Thompson-Nicola	2017
AGROFORESTRY			
Modular silvopasture training workshop development – Phase 2	*In progress, Ministry of Agriculture and Food*	Cariboo, Central South Interior	2023
Targeted knowledge transfer and development of producer-experience case studies in silvopasture	*In progress, Ministry of Agriculture and Food*	Thompson-Okanagan	2023
Silvopasture pilots: Crown Land	*In progress, Ministry of Agriculture and Food*	Central South Interior, Thompson-Okanagan, Hwy 16	2020-2023
Forage and water resiliency overview: managing water and forage resources in a changing climate	*In progress, Ministry of Agriculture and Food* Factsheet *Forthcoming: Landscape and range resiliency planning tool*	Provincial	2022-2023
Silvopasture 5-year knowledge transfer plan	*In progress, Ministry of Agriculture and Food*	Provincial	2022
Targeted grazing pilots	*In progress, Ministry of Agriculture and Food* Factsheet Video: Wildfire risk mitigation	Central South Interior, Kootenay-Boundary	2017-2023
Planning for biodiversity: a guide for BC farmers and ranchers	Guide	Provincial	2019
Silvopasture strip thinning pilot	Master's Student Dissertation	Cariboo	2018

Project	Project Resources*	Location	Year
Silvopasture producer demonstrations – private land planning	Factsheet	Cariboo	2017
WILDLIFE CONFLICT			
Best management practices for livestock protection	BMP Guide Loss Prevention BMPs for Cattle Loss Prevention BMPs for Sheep	Provincial	N/A

4.3 What's next: Looking ahead

Biodiversity-based practices can contribute to climate adaptation, reduction of net greenhouse gas emissions, and environmental stewardship. Implementing habitat and biodiversity beneficial management practices is shown to have positive outcomes for farm resilience and environmental health by fostering healthy soils and ecosystems.

On-Farm Management Practices

In the Central South Interior, habitat and biodiversity conservation practices generally fall into three strategies:

Habitat management integrates areas and landscape features that support biodiversity within or around agricultural lands. In the Central South Interior, a large proportion of farms have features like vegetative buffers. Specific habitat management practices include:

- Vegetative buffers/hedgerows
- Riparian restoration
- Conservation set-asides
- Wildlife corridors
- Agroforestry/silvopasture
- Riparian Fencing
- Bank Stabilization and Restoration
- Implementation and restoration of wetlands
- Alternative livestock watering systems
- Improved stream crossings
- Habitat structures and enhancement

Wildlife conflict management aims to reduce negative impacts to wildlife while maintaining agricultural productivity. Specific management practices include:

- Wildlife-friendly fencing
- Electric fencing
- Tree fruit netting
- Non-lethal deterrents/guard animals
- Crop selection and timing
- Electronic monitoring systems

Funding Programs: BIODIVERSITY AND HABITAT

The BC Ministry of Agriculture and Food, with delivery support from the Investment Agriculture Foundation offers the following cost share funding programs that address biodiversity and habitat:

- Bee BC
- Environmental Farm Plan Program (EFP)
- EFP Beneficial Management Practices Program - *biodiversity projects*
- Farmland Advantage - *payment for ecosystem services: riparian and grasslands*
- Agriculture Wildlife Program

Industry associations and conservation organizations offer the following biodiversity and habitat cost share funding programs:

- Species at Risk Partnerships on Agricultural Land (BCCA)
- Wetland Restoration (Ducks Unlimited Canada)

Provincial Toolbox: HABITAT AND BIODIVERSITY

Habitat and Biodiversity Assessment Tool - *forthcoming from CFGA (2023 update)*

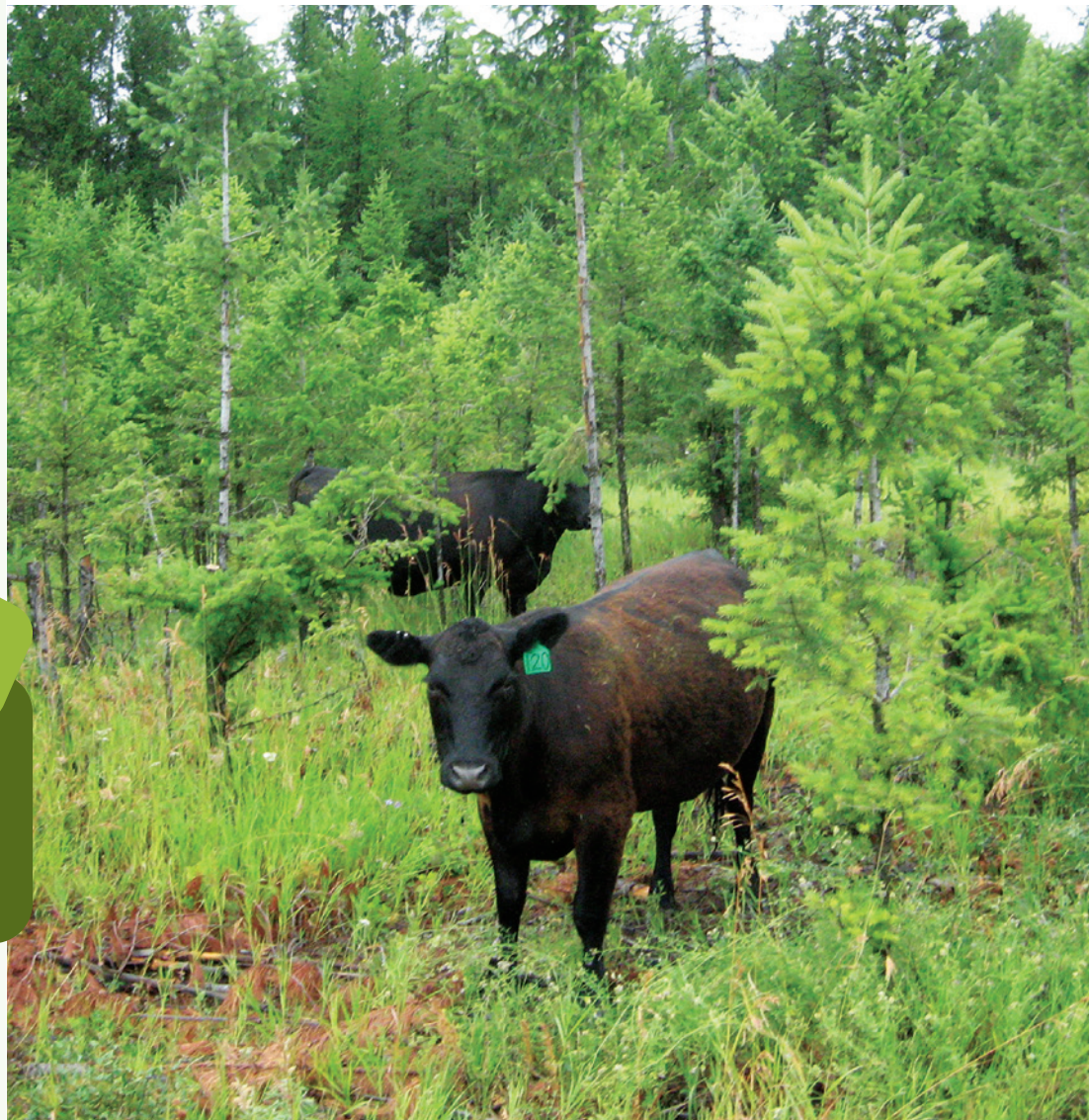
Biodiversity-friendly farm practices aim to maintain agricultural productivity while minimizing impacts to habitat and biodiversity. These beneficial management practices can overlap with those in priority areas such as soil health management and nutrient management and include:

- Cover cropping
- Reduced tillage
- Integration of woody perennials
- Integrated pest management
- Organic amendments

Building on Recent Projects

- Expand knowledge transfer and professional supports for implementation of riparian enhancement activities in agricultural areas
- Create a green flood infrastructure strategy and endowment for agriculture

Photo: Lisa Zabek



5 Crop Selection for Resilience

Photo: Emrys Miller

Adaptation

Environment

As the seasons become more variable, specific varieties of key crops that have historically been productive may underperform or become unreliable. Rising temperatures and increasing variability in temperature, frost, and precipitation patterns can reduce crop yields as well as create conditions for increased pest and disease pressures. Regionally adapted cultivars can be bred within the region of intended production to ensure crop traits function well in the local area.

As the impacts of climate change accelerate, producers are seeking crop varieties that produce well in periods of increased water stress, disease, or pest pressure. Varieties that can endure a broader range of temperatures and precipitation levels are important. Plant breeding and cultivar development is a slow process; upwards of 10 years may be needed to develop a new variety. This long timeline makes on-farm variety trials an important part of adaptation, so that farmers can better understand how existing varieties perform locally and share farmer-to-farmer knowledge of region-specific data and observations.

5.1 Why is crop selection for resilience a priority?

- **CHANGING TEMPERATURES and extreme weather events cause staple varieties to underperform:** Drought conditions and extreme events, such as the 2021 Western North America heat dome, have drastically reduced yield in staple varieties across commodities (notably forage, berries, tree fruits). Varieties that are more heat resilient are beginning to be preferred by producers across the province.
- **CHANGING PRECIPITATION patterns cause seeding and harvest timing and frequency to change:** As precipitation load shifts into spring and fall, producers may need to shift seeding and harvest times and frequency. Some commodities may increase harvest frequency, others (i.e. hay) may be reduced.
- **PEST & DISEASE PRESSURE may increase due to changing climatic conditions:** As temperature and precipitation shifts across the province, some regions may become more susceptible to pests and diseases of concern.

5.2 Crop selection for resilience projects

** Links in green are producer-oriented resources and tools*

Project	Project Resources*	Location	Year
TEMPERATURE, PRECIPITATION			
Sweet cherry and tree fruit variety development	*In progress, Agriculture and Agri-Food Canada*	Okanagan	2018-2023
Wine grape phenology in the Okanagan	Project report Monitoring protocol Factsheets	Okanagan	2019-2023
On-farm research in forage production	*In progress, Ministry of Agriculture and Food*	Cariboo, Central South Interior	2023
Forage variety trials	Factsheet	Cariboo-Chilcotin	2009-2012
Selecting suitable and adaptive dryland forage crops and varieties	Project report Tool: Forage U-Pick case studies (Species Selection) Factsheet: alfalfa Factsheet: brome grasses Factsheet: Forage selection guide	Bulkley-Nechako / Peace	2023
On-farm forage variety trials	A Guide to On-Farm Demonstration Research: Case studies Research guide	Bulkley-Nechako and Fraser-Fort George	2016-2017
TEMPERATURE, PRECIPITATION, PEST PRESSURE			
Testing new crops with on-farm research	Grab and Go Template for On-Farm Research	Kootenay Boundary Provincial	2018-2023
BC Seed Trials	Variety trial results Variety trial and seed growing resources list	Provincial	2016-2018
Canadian Organic Vegetable Improvement	Project description and publications list Webinar: Breeding carrots	National	2018-2023
Corn Hybrid Variety trials (forage)	Annual trial results	Fraser Valley	1999-2022

5.3 What's next: Looking ahead

The impacts of climate change on crops and associated pests and diseases are increasing, causing producers to implement strategies and practices to ensure crops are resilient. Beneficial management practices for crop and variety selection for resilience fall into three main strategies.

On-Farm Management Practices

Crop diversity and adaptation focuses on selecting and developing a diverse range of varieties adapted to regional conditions. This strategy requires participation from producers, industry, and academia to develop and trial new varieties. Management practices include:

- Regional adaptation of crop varieties with diverse selection
- Diversification of forage mixes
- Selection of climate resilient varieties

Management for pest and disease risks is achieved through a suite of practices that can help reduce losses associated with changing pest and disease pressures. Practices include:

- Crop rotation
- Integrated pest management
- Cover cropping
- Biosecurity to prevent introduction of new pests

Monitoring and adaptive management are critical to track the success of new variety trials. Practices include:

- On-farm research
- Continuous monitoring/scouting and data collection
- Real-time crop performance assessments
- Integration of local and Indigenous knowledge

Building on Recent Projects

- Coordinate local crop trials and farm practice research and demonstration with opportunities for farmer-to-farmer data sharing
- Improve regional weather station coverage and related decision support tools
- Establish and support regional weather network "hubs" to track detailed weather information to provide baseline information for regional crop selection and variety trials

Funding Programs: CROP SELECTION FOR RESILIENCE

- Perennial Crop Renewal Program
- AgriStability and associated programs - *agriculture income protection*

Provincial Toolbox: CROP SELECTION

Forage U-Pick (Species Selection Tool)

BC Tree Fruit Production Guide - *variety information*

Photo: Ministry of Agriculture and Food

Additional Resources

Climate change mitigation

- Opportunity Assessment of British Columbia's Agricultural Greenhouse Gas Reductions and Carbon Sinks (Ministry of Agriculture and Food/UBC)

Organic BC

- Podcast series
- Organic Innovation video series

Regional adaptation strategies

(BC Climate Change Adaptation Program)

- Cariboo Adaptation Strategies Plan (2015)
- Update, Cariboo Adaptation Strategies (2018)
- Okanagan Adaptation Strategies Plan (2016)
- Update, Okanagan Adaptation Strategies (2018)

For more information, visit our website.

Or email us:
AgriServiceBC@gov.bc.ca